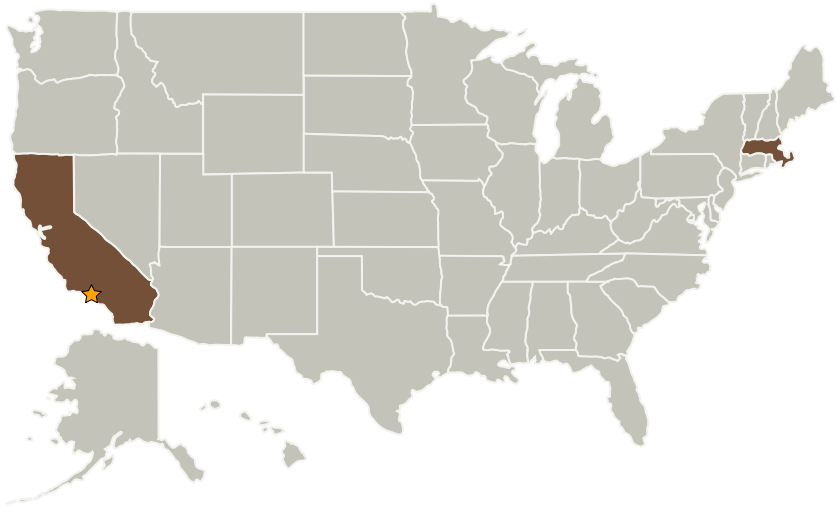
Ultraflat Tip-Tilt-Piston MEMS Deformable Mirror, Phase I

Completed Technology Project (2006 - 2006)

Project Introduction

It is proposed to develop a process for producing arrays of hexagonal mirror segments with deviation from flatness smaller than 1nm RMS over a 600?m segment span, using novel microfabrication techniques. Each segment will be rigid enough to withstand actuation (piston, tip, and tilt) by a triad of flexure-based electrostatic actuators that have already been demonstrated by the project team. The base for the mirror will be a conventionally surface micromachined silicon film, augmented by a thick epitaxial layer of silicon. Subsequently, this layer will be polished, annealed to relieve stresses, and then coated with a thin film of protected silver. The combined result of thickening, polishing, and annealing will produce segments that are flatter, by more than an order of magnitude, than any micromachined mirror segments that are available today. Preliminary data demonstrate some promise that these processes can be combined effectively. Such an array of mirror segments would constitute a significant technological milestone and an essential component for the visible nulling coronagraph instruments planned for the terrestrial planet finding (TPF) mission. The project team has considerable experience in fabricating micromirror arrays for laser communication, astronomical imaging and visions science applications and BMC is a world leader in the production of commercial high resolution wavefront controllers. The project leverages a existing successful relationship between BMC and JPL.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Jet Propulsion Laboratory (JPL)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Jet Propulsion Laboratory(JPL)	Lead Organization	NASA Center	Pasadena, California
Boston Micromachines Corporation	Supporting Organization	Industry	Cambridge, Massachusetts

Primary U.S. Work Locations	
California	Massachusetts

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.2 Observatories
    - TX08.2.1 Mirror Systems